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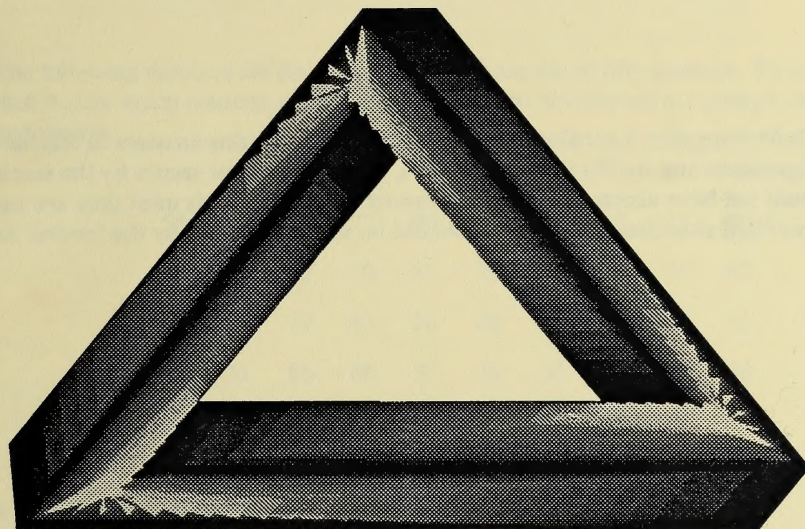
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MATHEMATICS 30

LEARNING FACILITATOR'S MANUAL

UNIT 6



**Distance
Learning**

Alberta
EDUCATION

Note

This Mathematics Learning Facilitator's Manual contains answers to teacher-assessed assignments and the final test; therefore, it should be kept secure by the teacher. Students should not have access to these assignments or the final tests until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.

Mathematics 30
Learning Facilitator's Manual
Unit 6
Statistics
Alberta Correspondence School
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Topic 1: The Normal Distribution

At the back of this Assignment Booklet is a table of **Areas under the Standard Normal Curve**. You may need this to complete some of the following questions.

- The following numbers are the test scores from a sample of fifty students. Develop a frequency distribution which consists of ten classes and use this distribution to calculate the mean, mode, and median.

58	63	68	77	90	53	43	55	47	60
57	76	65	70	81	28	49	73	88	67
36	75	72	87	96	40	46	51	57	61
42	76	83	66	57	39	48	54	62	86
52	60	85	72	45	59	43	68	47	51

- Determine the range for these test scores.

$$\begin{aligned}\text{range} &= 96 - 28 \\ &= 68\end{aligned}$$

- Calculate the class width, i .

Class width = range $\div$ number of classes

$$\begin{aligned}i &= 68 \div 10 \\ &= 6.8 \\ &= 7 \text{ (to the next whole number)}\end{aligned}$$

- Calculate the class limits and the class boundaries for each class interval.

First class interval:

$$\begin{aligned}\text{lower limit} &= \text{lowest score} \\ &= 28\end{aligned}$$

$$\begin{aligned}\text{upper limit} &= \text{lower limit} + (i - 1) \\ &= 28 + (7 - 1) \\ &= 34\end{aligned}$$

The first interval is (28 - 34).

Class boundaries are halfway between the upper limit of one class and the lower limit of the next class. The class boundaries for the first interval are 27.5 and 34.5. Calculate the class limits and boundaries for the remaining intervals. Enter these values in the frequency distribution table in part h of this problem.

①

- d. The class mark, x , or midpoint for each class interval is the average of the class limits.

The class mark for the first class interval is $x = \frac{28 + 34}{2} = \underline{31}$.

Compute the class marks for the remaining intervals and enter these values in the frequency distribution table.

①

- e. Tally the test scores on a separate piece of paper in order to determine the frequency for each class interval. Then, enter these frequencies in the frequency distribution table.

①

- f. Calculate the product $(f \cdot x)$ for each class interval in the frequency distribution table. This column is used in the calculation of the mean. Add the ten values which give the value of $\sum (f \cdot x)$ shown at the bottom of the $(f \cdot x)$ column.

①

- g. Complete the cumulative frequency column which is used in the calculation of the median.

- h. The values for the first two class intervals have been given in the following frequency distribution table. The reason for giving these values is to provide you with the proper start for completing the table.

Class Interval	Class Limits	Class Boundaries	Midpoint or Class Mark (x)	Frequency (f)	Products ($f \cdot x$)	Cumulative Frequency
1	28 - 34	27.5 - 34.5	31	1	$1 \times 31 = 31$	1
2	35 - 41	34.5 - 41.5	38	3	$3 \times 38 = 114$	4
3	42 - 48	41.5 - 48.5	45	8	$8 \times 45 = 360$	12
4	49 - 55	48.5 - 55.5	52	7	$7 \times 52 = 364$	19
5	56 - 62	55.5 - 62.5	59	9	$9 \times 59 = 531$	28
6	63 - 69	62.5 - 69.5	66	6	$6 \times 66 = 396$	34
7	70 - 76	69.5 - 76.5	73	7	$7 \times 73 = 511$	41
8	77 - 83	76.5 - 83.5	80	3	$3 \times 80 = 240$	44
9	84 - 90	83.5 - 90.5	87	5	$5 \times 87 = 435$	49
10	91 - 97	90.5 - 97.5	94	1	$1 \times 94 = 94$	50
				$\sum f = n =$ 50	$\sum (f \cdot x) =$ 3076	

①

- i. Determine the mean ($\bar{x}$) to two decimal places.

$$\bar{x} = \frac{\sum (f \cdot x)}{n} = \frac{3076}{50} = 61.52$$

①

- j. Determine the mode.

Examine the frequency column and note that the highest frequency is 9 and this frequency occurs in the interval 56 - 62. The midpoint of this interval is 59 so the mode is 59.

①

- k. Determine the median to two decimal places.

The cumulative frequency of the median is half the total cumulative frequency. The cumulative frequency of the median is $\frac{1}{2}(50) = 25$. A cumulative frequency of 25 is located in the interval 56 - 62. The boundaries of this interval are 55.5 and 62.5.

Interval with Class Limits 56 - 62

	<u>Boundaries</u>	<u>Cumulative Frequency</u>
(lower boundary)	55.5	19
	↓	↓
	y	25
	↓	↓
(upper boundary)	62.5	28

$$\frac{y - 55.5}{62.5 - 55.5} = \frac{25 - 19}{28 - 19}$$

$$\frac{y - 55.5}{7} = \frac{6}{9}$$

$$y = \underline{60.17}$$

The median is 60.17.

4

2. To determine the standard deviation (σ) for the data in question 1, three new columns with headings $(x - \bar{x})$, $(x - \bar{x})^2$, and $f \cdot (x - \bar{x})^2$ are required. Complete these values in the following table, but round your mean value ($\bar{x}$) from part i to the nearest whole number before determining the values. Round your final answer to one decimal place.

Class Interval	x	f	$(x - \bar{x})$	$(x - \bar{x})^2$	Products $f \cdot (x - \bar{x})^2$
1	31	1	-31	961	961
2	38	3	-24	576	1728
3	45	8	-17	289	2312
4	52	7	-10	100	700
5	59	9	-3	9	81
6	66	6	4	16	96
7	73	7	11	121	847
8	80	3	18	324	972
9	87	5	25	625	3125
10	94	1	32	1024	1024
					$\sum f \cdot (x - \bar{x})^2$ $= 11\ 846$

$$\sigma = \sqrt{\frac{\sum f \cdot (x - \bar{x})^2}{n}}$$

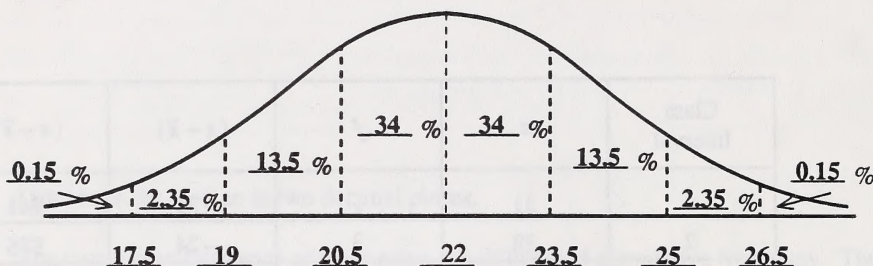
$$= \sqrt{\frac{11\ 846}{50}}$$

$$= \sqrt{236.92}$$

$$= 15.4$$

②

3. Temperature readings for a certain day in August over a period of years have a mean reading of 22°C and a standard deviation of 1.5°C . Complete the following normal curve diagram and assume normal distribution. Then, use this diagram to answer the questions that follow.



- a. What percent of the readings will be between 17.5°C and 20.5°C ?

$$2.35\% + 13.5\% = 15.85\%$$

- b. What percent of the data is within two standard deviations of the mean?

$$2(34\% + 13.5\%) = 2(47.5\%) \\ = 95.0\%$$

- c. What percent of the data is greater than 20.5°C ?

$$100\% - (13.5\% + 2.35\% + 0.15\%) \text{ or } 34\% + 34\% + 13.5\% + 2.35\% + 0.15\% = 84\%$$

②

4. Cookies packaged in boxes have a mean mass of 180 g. The standard deviation is 2 g.

a. When 8000 boxes are produced, how many boxes are within 2 g of the required mass?

$$0.68 \times 8000 = 5440$$

When 8000 boxes are produced, 5440 will be within 2 g of the required mass.

b. How many boxes will not be accepted if the boxes must have a mass between 176 g and 184 g?

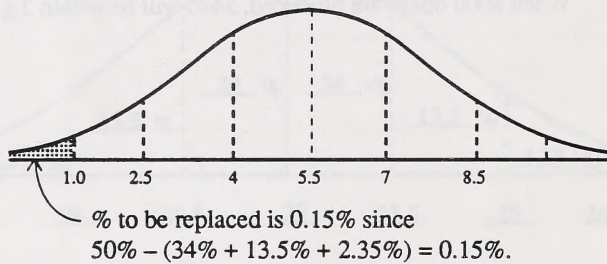
$$(2.5\% + 2.5\%) = 5\%; \text{ thus, } \frac{5}{100} \times 8000 = 400.$$

Four hundred boxes will not be accepted.

2

5. A cordless grass shear manufacturer determines the mean life of its shears to be 5.5 years, with a standard deviation of 1.5 years.

- a. If the manufacturer guarantees the shears for one year, what percentage of the shears will have to be replaced?



The percentage that will need to be replaced is 0.15%.

- b. If 4000 shears are sold to stores, how many shears will have to be replaced within one year?

$$\frac{0.15}{100} \times 4000 = 6$$

Six shears will have to be replaced.

Check by formula and z-score table.

$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{1 - 5.5}{1.5}$$

$$z = \frac{-4.5}{1.5}$$

$$z = -3$$

The area for $z = -3$ is 0.4987.

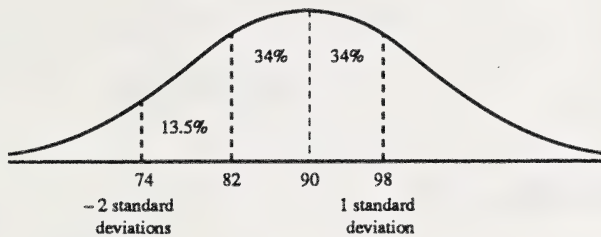
Required area = $0.5 - 0.4987 = 0.0013 = 0.13\%$

The table is set for 34.13, 13.59, 2.15, and 0.13 not for 34, 13.5, 2.35, and 0.15.

By the z-score method the number of shears that have to be replaced is $\frac{0.13}{100} \times 4000 = 5$.

①

6. Some test scores are normally distributed with a mean of 90 and a standard deviation of 8. What percentage of the test scores fall between 74 and 98?



$$34\% + 34\% + 13.5\% = 81.5\%$$

Method Using z-Scores

$$z_1 = \frac{74 - 90}{8}$$

$$z_1 = \frac{-16}{8}$$

$$z_1 = -2$$

$$z_2 = \frac{98 - 90}{8}$$

$$z_2 = 1$$

Use the z-score table to obtain the area from $z = 1$ to $z = -2$.

$$\text{Area} = 0.4772 + 0.3413$$

$$= 0.8185$$

$$= 81.85\%$$

②

7. A student obtains a mark of 84 on a math exam. The mean mark for this math exam is 76 and the standard deviation is 12. This same student obtains a mark of 88 on a physics exam. For the physics exam, the mean mark is 79 and the standard deviation is 16. In which course does the student have a better relative standing?

z for math

$$z = \frac{84 - 76}{12}$$

$$z = 0.67$$

z for physics

$$z = \frac{88 - 79}{16}$$

$$z = \frac{9}{16}$$

$$z = 0.56$$

The student has a better relative standing in mathematics.

①

8. The mean grade for a test was 67 and the standard deviation was 9. If a student had a z-score of 0.78, what was the student's test mark?

$$z = \frac{x - \mu}{\sigma}$$

$$0.78 = \frac{x - 67}{9}$$

$$x - 67 = 9(0.78)$$

$$x = 67 + 7.02$$

$$x = 74$$

The student's test mark was 74%.

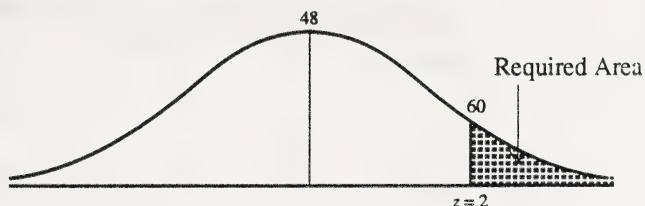
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9. A battery company determines the mean life of its car batteries to be forty-eight months with a standard deviation of six months.

- a. What is the probability that a battery will last longer than sixty months?

$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{60 - 48}{6} = \frac{12}{6} = 2$$



The area for $z = 2$ is 0.4772.

The required area is $0.5 - 0.4772 = 0.0228$.

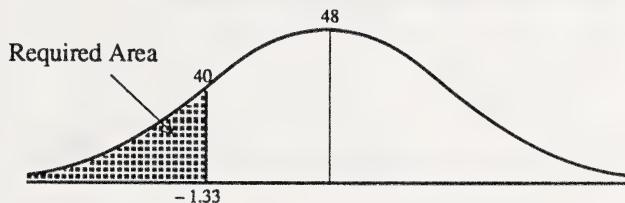
The probability that a battery lasts longer than sixty months is 0.0228.

Approximate Area Method:

$$\begin{aligned} \text{Required area} &= 0.5 - (0.34 + 0.135) \\ &= 0.025 \end{aligned}$$

The probability is 0.025.

- b. If the company guarantees the battery for forty months, what percentage of batteries will have to be replaced?



$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{40 - 48}{6} = \frac{-8}{6} = -1.33$$

The area for $z = -1.33$ is 0.4082.

The required area is $0.5 - 0.4082 = 0.0918$.

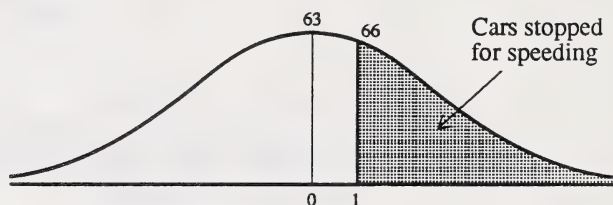
The percentage of batteries that will need to be replaced is 9.18%.

③

10. The speeds of vehicles in a 60 km/h zone are normally distributed about a mean of 63 km/h with a standard deviation of 3 km/h. The police must allow 10% of the posted speed limit in case of error. If 120 cars pass through a radar speed trap in which the posted speed limit is 60 km/h, determine the number of cars stopped for speeding. Assume that all the cars travelling 10% or more above the speed limit will be ticketed.

Since $60 + 0.10 (60) = 60 + 6 = 66$, cars going 66 km/h or faster will be stopped for speeding.

$$\begin{aligned} z &= \frac{x - \mu}{\sigma} \\ &= \frac{66 - 63}{3} \\ &= 1 \end{aligned}$$



The area for $z = 1$ is 0.3413.

Required area = $0.5000 - 0.3413$

$$= 0.1587$$

$$0.1587 \times 120 = 19.044$$

Thus, nineteen cars are stopped for speeding.

- ② 11. A clothes dryer manufacturer determines the mean life of a dryer to be eighty-six months with a standard deviation of thirty-six months. What guarantee, to the nearest month, should the manufacturer offer if it is only willing to repair 3% of the machines sold?

$$50\% - 3\% = 47\%$$

$$z\text{-score for } 0.47 = -1.88$$

$$z = \frac{x - \mu}{\sigma}$$

$$-1.88 = \frac{x - 86}{36}$$

$$-67.68 = x - 86$$

$$86 - 67.7 = x$$

$$18.3 = x$$

The guarantee should be for eighteen months.

Check

$$\text{Let } x = 18.$$

$$z = \frac{18 - 86}{36}$$

$$= \frac{-68}{36}$$

$$= -1.89$$

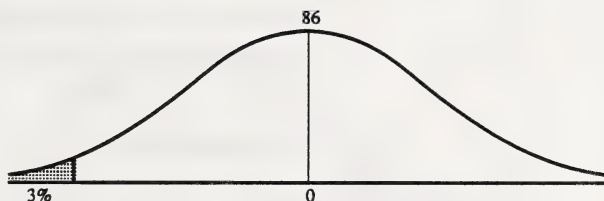
$$\text{Area} = 0.4706$$

$$\text{Required area} = 0.5 - 0.47$$

$$= 0.03$$

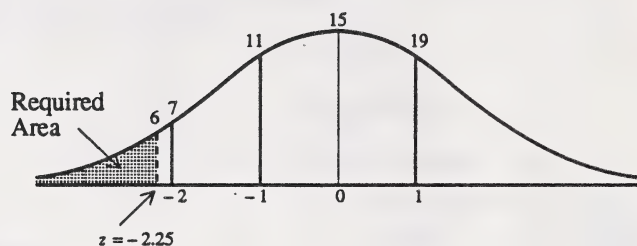
$$= 3\%$$

This agrees with the percentage of machines that the manufacturer is willing to repair.



②

12. A manufacturer of electric lawn and gardening tools determines that the mean life of its best hedge trimmer is fifteen years, and the standard deviation is four years. What is the probability that a hedge trimmer must be returned within six years?



$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{6 - 15}{4}$$

$$z = \frac{-9}{4}$$

$$z = -2.25$$

The area for $z = -2.25$ is 0.4878.

Required area = $0.5 - 0.4878$

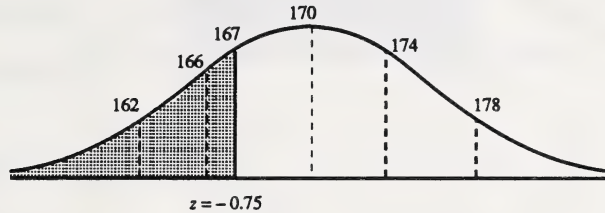
$$= 0.0122$$

The probability is 0.0122.

4

13. In a survey of 200 male students it is determined that their mean height is 170 cm and the standard deviation is 4 cm. Assume a normal distribution for the heights and answer the following questions.

- a. How many students have heights of 167 cm or less?



$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{167 - 170}{4}$$

$$= -\frac{3}{4}$$

$$= -0.75$$

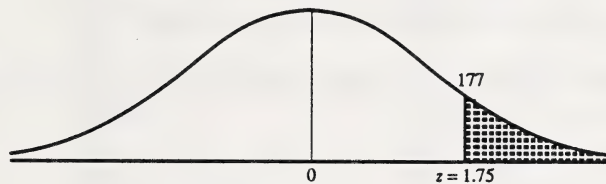
The area for $z = -0.75$ is 0.2734.

The required area is $0.5 - 0.2734 = 0.2266$.

Thus, $0.2266 \times 200 = 45.32$.

Thus, forty-five students have heights 167 cm or less.

- b. How many students have heights of 177 cm or more?



$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{177 - 170}{4}$$

$$= \frac{7}{4}$$

$$= 1.75$$

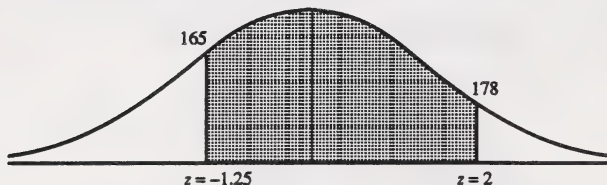
The area for $z = 1.75$ is 0.4599.

The required area is $0.5 - 0.4599 = 0.0401$.

Thus, $0.0401 \times 200 = 8.02$.

Thus, eight students have heights 177 cm or more.

- c. How many students have heights between 165 cm and 178 cm?



165 cm

$$z = \frac{165 - 170}{4}$$

$$= -\frac{5}{4}$$

The area for $z = -1.25$ is 0.3944.

178 cm

$$z = \frac{178 - 170}{4}$$

$$z = 2$$

The area for $z = 2$ is 0.4772.

The total area is $0.3944 + 0.4772 = 0.8716$.

$$0.8716 \times 200 = 174.32$$

Thus, 174 students have heights between 165 cm and 178 cm.

- d. Sixteen percent of the students are below what height?

To find 16% below a certain height, use 34%. From the tables an area of 0.34 gives a z-score of -1.

$$z = \frac{x - \mu}{\sigma}$$

$$-1 = \frac{x - 170}{4} \quad (-0.995 \text{ rounded to two decimal places is } -1.00.)$$

$$-4 = x - 170$$

$$x = 166 \text{ cm}$$

Sixteen percent of the students are below 166 cm.

Topic 1

_____ marks

Topic 2: Bivariate Data

①

1. Circle the correct response.

The science of collecting and classifying data in order to show their significance is called

a. data processing

☒ b. statistics

c. technology

d. mathematics

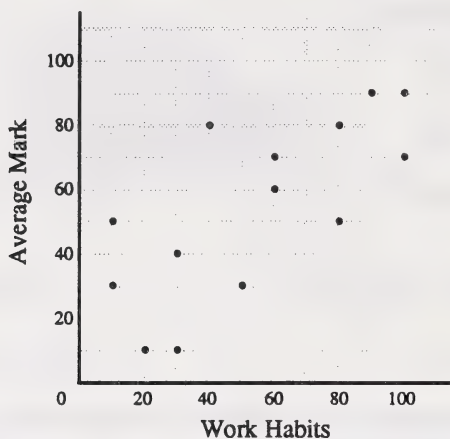
The correct response is b.

2. The following table of marks shows the relationship between the work habits and the average marks for students at a college.

Students	Rating of Work Habits	Average Mark
Marie	30	10
Sue	10	30
Joe	30	40
Gary	10	50
Gurmeet	50	30
Sandy	60	60
Lou	60	70
Jerry	40	80
Maria	80	80
Rhonda	80	50
Olga	100	70
Joyce	100	90
Chen	90	90
Roy	20	10

②

- a. Draw a scatterplot of the work habits of the students against their average marks. Place the work habits along the horizontal axis.



①

- b. Is there a positive correlation, negative correlation, or no correlation?

There is a strong positive correlation between work habits and the average mark. Students with good work habits generally have higher averages.

②

- c. Discuss the performances of Sandy, Maria, and Chen.

Sandy, Maria, and Chen all have the same ratio of work habit rating to average mark. They are consistent. However, they are not performing equally well. Sandy is much lower than Chen as far as achievement is concerned.

②

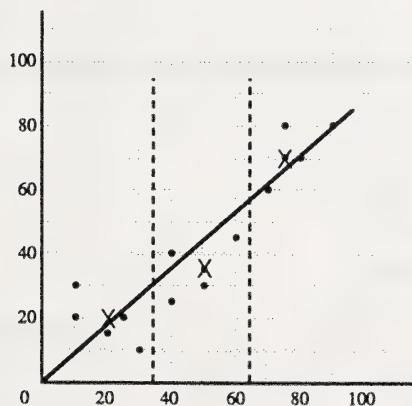
- d. How do the results of Gary and Jerry vary?

Gary's mark was average in the course, yet he performed very low on the work habit rating. This would seem to suggest that there is no relationship between his average score and his work habit rating.

In the case of Jerry, his average mark is fairly high while his work habit rating is low. This shows that you cannot always be sure about the relationship as predicted by the correlation coefficient.

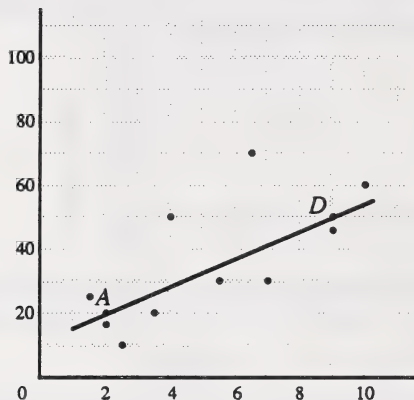
③

3. Find the line of best fit for the following scatterplot using the median fit method.



3

4. Determine the equation for the line of best fit AD on the following scatterplot.



Use points $A(2, 20)$ and $D(9, 50)$ to find the slope of the line of best fit.

$$m = \frac{y_0 - y_1}{x_0 - x_1}$$

$$m = \frac{50 - 20}{9 - 2}$$

$$m = \frac{30}{7}$$

Substitute the slope and the coordinates of point D into the point slope form of the linear equation.

$$y - y_1 = m(x - x_1)$$

$$y - 50 = \frac{30}{7}(x - 9)$$

$$7y - 350 = 30x - 270$$

$$0 = 30x - 7y + 80$$

The equation of the line is $30x - 7y + 80 = 0$.

①

5. Circle the correct response.

Which of the following is the range of the correlation coefficient?

a. $-1 \leq r \leq 1$

b. $0 \leq r \leq 1$

c. $-1 < r \leq 1$

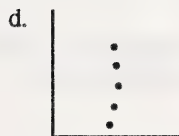
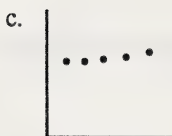
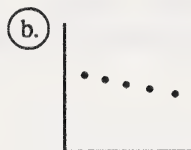
d. $-1 \leq r \leq 0$

The correct response is a. The correlation coefficient may be -1 for a strong negative correlation and $+1$ for a strong positive correlation.

①

6. Circle the correct response.

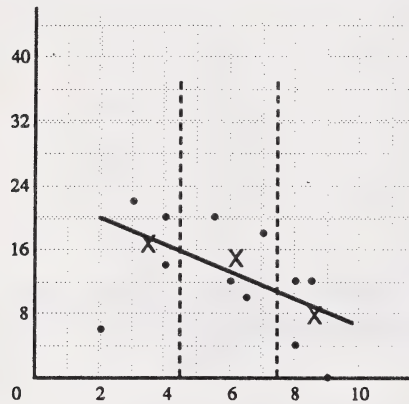
Which of the following graphs is an example of a strong negative correlation?



The correct response is b.

②

7. Draw the line of best fit for the following scatterplot.



①

8. Circle the correct response.
Which of the following is the weakest correlation coefficient?

- a. $+0.6$
- b. -0.55
- c. $+0.12$
- ☒ d. $+0.04$

The correct response is d. There is very little correlation between the two sets of data when the correlation coefficient is 0.04.

- ① 9. Circle the correct response.
Which of the following indicates how well the line of best fit demonstrates the situation?
- a. standard deviation
 - ② b. correlation coefficient
 - c. confidence coefficient
 - d. sample of the population

The correct response is b.

Topic 2

_____ marks

Topic 3: Confidence

Circle the correct response for questions 1 to 3.

- ① 1. The proportion of the number of yeses in a population is called the
- ☒ a. population percentage
 - b. sample proportion
 - c. confidence interval
 - d. sampling distribution

The correct response is a. The population percentage is the percentage (or proportion) of objects in the population that are yeses.

- ① 2. Which type of sampling is not a type of convenience sampling?
- a. self-selected
 - b. judgement
 - ☒ c. clustered
 - d. biased

The correct response is c. At no time does the surveyor decide who will be included in the sample; thus, clustered sampling is not a type of convenience sampling.

- ① 3. A sample in which an expert selects the sample based on knowledge of the population is called
- a. systematic sampling
 - b. self-selected sampling
 - c. clustered sampling
 - ④ d. judgement sampling

The correct response is d.

- ⑫ 4. Explain any four of the following.
- a. correlation

The correlation between two or more variables is a measure of the relationship between the variables. If two variables are correlated, they generally have a lot in common. Mathematics and science, for example, should have a strong correlation. On a grid, a positive correlation has its graph rising to the right. A negative correlation has its graph falling to the right.

A measure of how well two variables are related is given by the correlation coefficient. The range of this coefficient is between -1 and $+1$ or $-1 \leq r \leq 1$.

It should be noted that -1 represents a very strong negative correlation and $+1$ represents a very strong positive correlation.

b. bivariate

A set of data that contains two variables is said to be bivariate. For example, if you compare the wingspan of an aircraft with the cost of the aircraft, you would be dealing with two variables that are not closely related yet have a correlation. The correlation may be negative or positive, but the correlation does exist.

A study of this bivariate data would produce a scatterplot graph, and a line of best fit would indicate the correlation.

c. line of best fit

Sometimes the points on a scatterplot graph appear to be clustered about a line. The straight line that can be drawn joining the greatest possible number of points on the scatterplot is called the line of best fit.

The slant of the distribution can be determined by this line. The line of best fit is usually sketched so that an equal number of points lie on either side of the line. If the points are close to the line, you have strong correlation between the variables. A strong correlation may be either negative or positive.

d. measures of central tendency

The three main measures of central tendency are the mean, mode, and median. They are good indicators as to the distribution of the data. Each gives a different measure of how the data is grouped around the centre. They also summarize the distribution of a sample. If the mean, mode, and median are close to each other, the distribution is said to be normal.

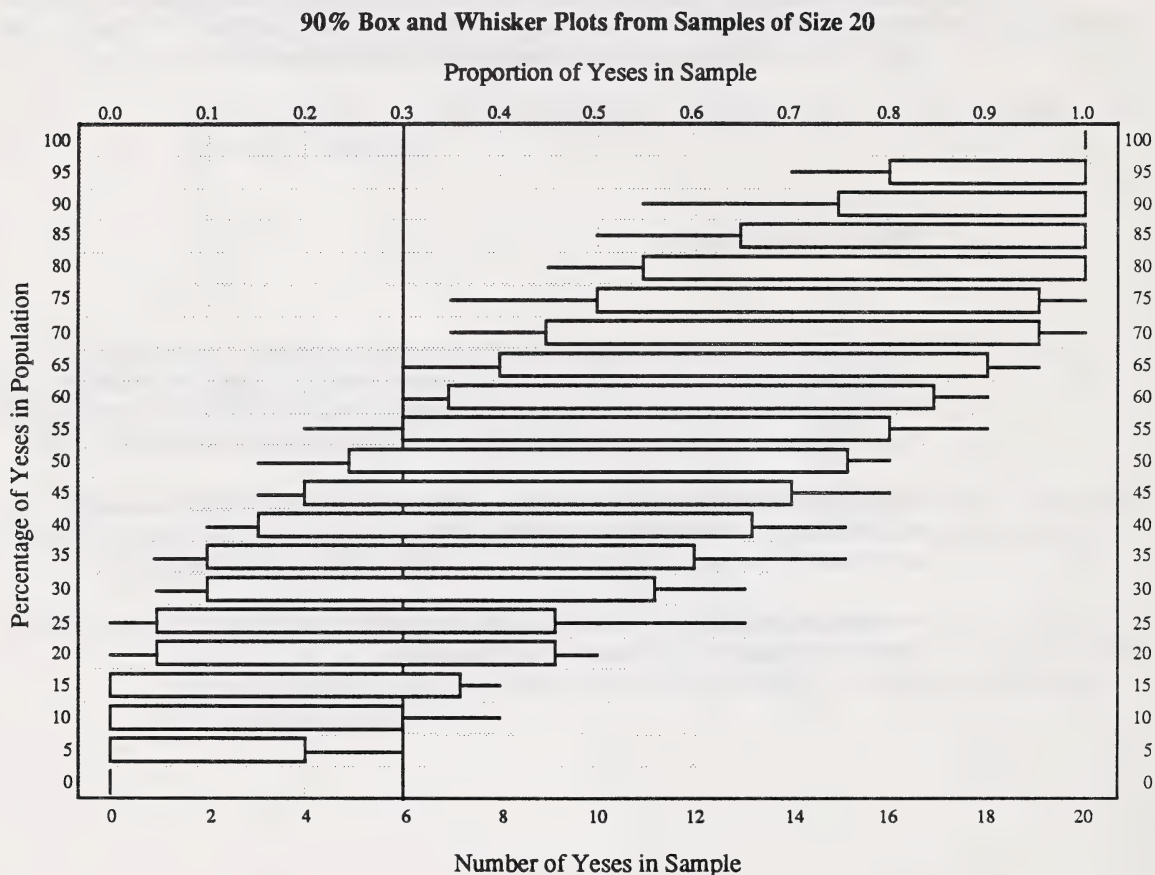
e. 95% box and whisker plots

Surveys and polls are often designed to collect yes or no responses to a question from samples within a population. The number of positive responses in each of the samples is used to calculate the population percentage, which is the percentage of the entire population that would respond positively. This information is then organized into a box and whisker plot.

The 95% box and whisker plot is designed so that when further samples of the same size are taken from the population, 95 out of 100 samples will have the number of positive responses as indicated by the box in the plot. Five samples out of 100 will be outside of the box.

A box and whisker plot is one way of showing the amount of confidence that you have in predicting the outcome of a sample of a certain size.

5. A survey of parents was conducted to find out if they thought they were failures at parenting. The box and whisker plot charts that follow show the results of the survey. Study this chart and answer the questions that follow.



- ② a. How many parents answered yes?
Six respondents said yes, they thought they were failures at parenting.
- ② b. How many parents were polled?
The survey interviewed a random sample of twenty parents.
- ② c. What is the sample proportion?
The sample proportion, according to the chart, is 0.3.
- ② d. What percentage of box and whisker plots was used?
The surveyor used a 90% box and whisker plot from a sample size of 20.
- ② e. What is the confidence interval?
According to the chart, 10% to 55% is a 90% confidence interval. In other words, between 10% and 55% would answer yes to the question 90% of the time.
- ② f. What are the lower and upper confidence limits?
The lower confidence limit is 10% and the upper confidence limit is 55%.

5

6. Construct a sampling distribution using the following data.

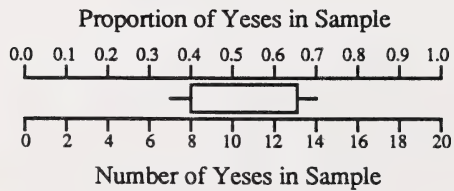
Sample Number	Responses	Number of Yeses
1	NNYNNNNYNNNYNNNNNNNN	4
2	YNNYNNNYNNNNNNNNNNY	6
3	YYYNNNNNYNNNNYNNYNY	8
4	NNNYNNNNYNNNNNNNNYNN	4
5	YYYNNNNNYNNNNNNNNYYY	8
6	NNNNNNNNYNNNNYNNNNYN	5
7	YYYNNNYNNYYYNNNNYNN	10
8	NNNYNNNNYNNNNNNNNYNN	6
9	NYNNNYNNNNYNNYNNNNYNN	7
10	NNYNNNNYNNNNYNNNNYNNY	7
11	NYNNNNNYNNNNNNNNNNYN	5
12	YYYNNNNNNNNNNYNNYYYNN	8
13	NNNYYYYNNNNYNNYNNNNY	9
14	YNNNNYNNNNYNNNNYNNNY	7
15	NNNNNNYNNYYYNNYNNYNN	9
16	NNNYNNNNYNNNYNNNNYNN	6
17	NNYNNNNYNNNNYNNNNNY	6
18	NNNNNNNNYNNYYYNNNNY	7
19	NNNNNNYNNNNYYYNNYNNY	7
20	YYYNNNNNNYNNNNNNNNNN	5

Number of Yeses	Sample Proportion	Frequency	Proportion of All Trials
0	0.00	0	0
1	0.05	0	0
2	0.10	0	0
3	0.15	0	0
4	0.20	2	0.1
5	0.25	3	0.15
6	0.30	4	0.2
7	0.35	5	0.25
8	0.40	3	0.15
9	0.45	2	0.1
10	0.50	1	0.05
11	0.55	0	0
12	0.60	0	0
13	0.65	0	0
14	0.70	0	0
15	0.75	0	0
16	0.80	0	0
17	0.85	0	0
18	0.90	0	0
19	0.95	0	0
20	1.00	0	0
Total		20	1.00

4

7. Use the following sample distribution to make a 90% box and whisker plot.

Number of Yeses	Sample Proportion	Frequency	Proportion of All Trials
0	0.00	0	0
1	0.05	0	0
2	0.10	0	0
3	0.15	0	0
4	0.20	0	0
5	0.25	0	0
6	0.30	0	0
7	0.35	1	0.05
8	0.40	1	0.05
9	0.45	4	0.2
10	0.50	5	0.25
11	0.55	3	0.15
12	0.60	3	0.15
13	0.65	2	0.1
14	0.70	1	0.05
15	0.75	0	0
16	0.80	0	0
17	0.85	0	0
18	0.90	0	0
19	0.95	0	0
20	1.00	0	0
Total		20	1.00



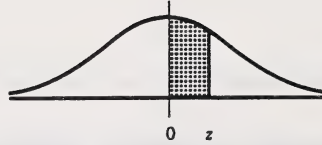
8. Fill in the following blanks.

- ① a. A random sample is selected when each member of the population has an equal chance of being selected and the members of the sample are chosen independently.
- ① b. A sample is said to be biased if a selection method tends to overrepresent or underrepresent some part of the population.
- ① c. Judgement and self-selected samples are both types of convenience sampling.
- ① d. A stratified random sample occurs when the population is divided into different strata, and then a random sample is taken from each strata.

Topic 3

_____ marks

**Areas
under the
Standard
Normal Curve**



z	0	1	2	3	4	5	6	7	8	9
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0754
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2258	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2996	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

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